

Mechanical Design Review Checklist for Military Projects

Scope

This instruction covers the Mechanical Design Review Checklist for Military Projects. It outlines the features and elements that should be checked to perform a proper Mechanical design review.

Distribution

Mechanical Engineer*

Ownership

The Mechanical Engineer [[Scott.L.Barmann@usace.army.mil?Subject=INSP23L0-Mechanical Design Review Checklist for Military Projects](mailto:Scott.L.Barmann@usace.army.mil?Subject=INSP23L0-Mechanical%20Design%20Review%20Checklist%20for%20Military%20Projects)] is responsible for ensuring that this document is necessary and that it reflects actual practice.

References

Refer to:

- *UFC 1-200-01, Design: General Building Requirements*
[\[http://www.hnd.usace.army.mil/techinfo/ufc/UFC+1-200-01.pdf\]](http://www.hnd.usace.army.mil/techinfo/ufc/UFC+1-200-01.pdf)
- *UFC 3-400-01, Design: Energy Conservation*
[\[http://www.hnd.usace.army.mil/techinfo/ufc/081602_UFC3-400-01.pdf\]](http://www.hnd.usace.army.mil/techinfo/ufc/081602_UFC3-400-01.pdf)
- *UFC 3-400-02, Design: Engineering Weather Data*
[\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC 3-400-02.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC%203-400-02.pdf)
- *UFC 3-410-01FA, Design: Heating, Ventilating and Air Conditioning*
[\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-01FA/UFC3-410-01FA.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-01FA/UFC3-410-01FA.pdf)
- *UFC 3-410-02A, Design: Heating, Ventilating and Air Conditioning (HVAC) Control Systems* [\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-02A/UFC3-410-02A.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-02A/UFC3-410-02A.pdf)
- *UFC 3-410-04N, Design: Industrial Ventilation*
[\[http://www.ccb.org/docs/UFC/3_410_04.pdf\]](http://www.ccb.org/docs/UFC/3_410_04.pdf)
- *UFC 3-420-01, Design: Plumbing* [\[http://www.ccb.org/docs/UFC/3_420_01.pdf\]](http://www.ccb.org/docs/UFC/3_420_01.pdf)
- *UFC 3-420-02FA, Design: Compressed Air*
[\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-420-02FA/UFC3-420-02FA.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-420-02FA/UFC3-420-02FA.pdf)
- *UFC 3-600-01, Design: Fire Protection Engineering for Facilities*
[\[http://www.ccb.org/docs/UFC/3_600_01.pdf\]](http://www.ccb.org/docs/UFC/3_600_01.pdf)
- *UFC 4-010-01, DoD Minimum Antiterrorism Standards*
[\[http://www.ccb.org/docs/UFC/4_010_01.pdf\]](http://www.ccb.org/docs/UFC/4_010_01.pdf)
- *Integrating Lessons Learned [PROA04L0]*

Activity Preface

These tasks are performed whenever a Project Manager requests a review of a Mechanical Design.

Prior Activity

Contract Review [PROP01L0]

Mechanical Engineer

1. Determine the level of review required.

There are three levels of review:

- If work looks professionally complete and there is a good PM on the project, then only crucial issues need review.
- If work appears incomplete, then another level of investigation is added.
- If it is a medical/health facility or by special request, then do full, in-depth design review.

2. Check SOW/SOS for the list of issues to be reviewed.

All other items will be A-E responsibility.

3. Check SOW/SOS for the list of project criteria.

Verify the correct design criterion and date has been listed in the SOW and design analysis (UFC's and ETL's).

- MAJCOM Criteria
- Required submittals
- Base Criteria

4. Review Lessons Learned Checklist.

Refer to *Integrating Lessons Learned* [\[PROA04L0\]](#)

- The mechanical designer should create the LL Checklist to be applied to the specific project design. The PM should provide a LL Checklist to any A-E for the specific project design.
- The mechanical designer should provide the Lessons Learned Checklist applied to the specific project design for review. Confirm the LL on the checklist have been incorporated into the project design.
- Provide review comment in Dr. Checks notifying the designer of any specific Lessons Learned that need to be incorporated into the project.

5. Consult designers.

Meet with A-E or IHD personnel at various stages of design to influence decision points:

- Pre-design conference.
- 10% review
- At request of specific discipline, etc.
- Consider visit to AE office 2 weeks prior to submittal to insure compliance with project requirements.
- Shift review from end to beginning stages.

6. Discuss informal evaluation/comparison studies.

Do this outside of formal submittal process.

7. Check for Complete Submittal.

Verify the overall completeness of the submitted documents (design analysis, calculations, drawings, and specifications) appears appropriate for the applicable design stage.

Refer to:

- UFC 1-200-01, Design: General Building Requirements
[\[http://www.hnd.usace.army.mil/techinfo/ufc/UFC+1-200-01.pdf\]](http://www.hnd.usace.army.mil/techinfo/ufc/UFC+1-200-01.pdf)
- UFC 3-400-01, Design: Energy Conservation
[\[http://www.hnd.usace.army.mil/techinfo/ufc/081602_UFC3-400-01.pdf\]](http://www.hnd.usace.army.mil/techinfo/ufc/081602_UFC3-400-01.pdf)
- UFC 3-400-02, Design: Engineering Weather Data
[\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC 3-400-02.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC 3-400-02.pdf)
- UFC 3-410-01FA, Design: Heating, Ventilating and Air Conditioning
[\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-01FA/UFC3-410-01FA.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-01FA/UFC3-410-01FA.pdf)
- UFC 3-410-02A, Design: Heating, Ventilating and Air Conditioning (HVAC) Control Systems [\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-02A/UFC3-410-02A.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-410-02A/UFC3-410-02A.pdf)
- UFC 3-410-04N, Design: Industrial Ventilation
[\[http://www.ccb.org/docs/UFC/3_410_04.pdf\]](http://www.ccb.org/docs/UFC/3_410_04.pdf)
- UFC 3-420-01, Design: Plumbing [\[http://www.ccb.org/docs/UFC/3_420_01.pdf\]](http://www.ccb.org/docs/UFC/3_420_01.pdf)
- UFC 3-420-02FA, Design: Compressed Air
[\[http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-420-02FA/UFC3-420-02FA.pdf\]](http://www.hnd.usace.army.mil/techinfo/UFC/UFC3-420-02FA/UFC3-420-02FA.pdf)
- UFC 3-600-01, Design: Fire Protection Engineering for Facilities
[\[http://www.ccb.org/docs/UFC/3_600_01.pdf\]](http://www.ccb.org/docs/UFC/3_600_01.pdf)
- UFC 4-010-01, DoD Minimum Antiterrorism Standards
[\[http://www.ccb.org/docs/UFC/4_010_01.pdf\]](http://www.ccb.org/docs/UFC/4_010_01.pdf)

8. Check Guide Specifications.

Verify all the correct guide specifications have been referenced and used (Army UFGS and/or Unified UFGS). Verify the guide specs are not old reused specs from an old project (unless specifically allowed by the SOW). Verify guide specs reference the most current

version of NFPA and ASHRAE standards. Navy guide specs should only be used if an equivalent Army guide spec is unavailable.

9. Check Drawing format.

Verify drawing numbering meets CADD standards.

10. Check Design Analysis.

Review the mechanical, plumbing and fire protection design analysis. Verify the proposed mechanical, plumbing and fire protection systems meet the requirements established by military criteria, the scope of work, and the minutes of the pre-design meeting.

11. Check Customer Design Guide.

Verify compliance of all mechanical, plumbing, and fire protection systems with the current base design guide.

12. Check Qualified Fire Protection Engineer.

Verify design analysis shows evidence of compliance with UFC 3-600-01 [http://www.ccb.org/docs/UFC/3_600_01.pdf] paragraph 1-6:

“Major projects require the services and review of a qualified fire protection engineer. Projects involving design or modification of, fire rated construction, fire detection, fire suppression, or life safety systems require the services and review of a qualified fire protection engineer. A qualified fire protection engineer is an integral part of the design team, and must be involved in every aspect of the design as it relates to fire protection. This includes, but is not limited to, building code analysis, life safety code analysis, design of automatic detection and suppression systems, water supply analysis, and a multi-discipline review of the entire project. For the purposes of meeting this requirement, a qualified fire protection engineer is defined as an individual meeting one of the following conditions: ...”

13. Check Fire Sprinkler Protection.

Refer to UFC 3-600-01 [http://www.ccb.org/docs/UFC/3_600_01.pdf]

- Verify fire sprinkler protection has been provided if required by UFC 3-600-01 Section 4-2.
- Verify water flow test was witnessed by the A-E as required by UFC 3-600-01 Section 4-1.3 and included in the contract documents.
- Verify the sprinkler system hazard occupancy ratings are appropriate.
- Verify sprinkler system water demand has been properly calculated (design areas, densities, hose stream) as listed by UFC 3-600-01 Table 4-1 and included in the contract documents.
- Verify additional 30% design area is specified for roof slopes exceeding 1:6 per NFPA 13-2002 para. 11.2.3.2.4.

- Verify if a fire pump or water storage is required (or if design area can be reduced to eliminate need for a fire pump).

13. Check Energy Conservation.

Verify energy conservation requirements listed by UFC 3-400-01 [http://www.hnd.usace.army.mil/techinfo/ufc/081602_UFC3-400-01.pdf] have been addressed by the design analysis, calculations, drawings, and specifications (ASHRAE 90.1).

14. Check Fuel Fired Equipment Protection.

Verify fuel fired mechanical & plumbing equipment is located and isolated from the remainder of the facility by appropriate levels of fire rated and/or smoke rated partitions and dampers as required by UFC 3-600-01 [http://www.ccb.org/docs/UFC/3_600_01.pdf], IBC, NFPA 101, NFPA 90A, and applicable ETL's.

15. Check Fuel Fired Equipment Installation

Verify fuel fired mechanical & plumbing equipment installation is shown be with proper combustion air, fuel supply lines, vented pressure regulators, chimney/flue, etc. as required by IBC, NFPA 90A, NFPA 54, and local air quality control district requirements.

16. Check Outside Air Ventilation.

Verify outside air intakes are appropriately sized and located relative to prevailing winds, exhaust fans/louvers/vents, plumbing vents, gas regulator vents, and fuel fired equipment vents. Verify outside air intakes are elevated a minimum 10 feet above grade per UFC 4-010-01 [http://www.ccb.org/docs/UFC/4_010_01.pdf].

17. Check Equipment Location Coordination.

Verify the location and size of all interior and exterior mechanical & plumbing equipment, louvers, chimneys, etc., have been coordinated with other disciplines (roof plan, site plan, landscaping plan, electrical power plan, structural plan, elevations).

18. Check Equipment Maintenance Clearances.

Verify sufficient clearances and access has been provided for safe maintenance procedures and equipment replacement.

19. Check Plumbing Fixtures.

Verify plumbing fixture type and locations against architectural floor plans plumbing specifications.

20. Check Plumbing Utility Lines.

Verify coordination of plumbing vents and utility lines (gas, water, sewer, interior rain water leaders, etc.) against architectural roof plans, structural footing plans, landscaping plans, and site utility plans.

21. Check Design Calculations.

Review all mechanical, plumbing and fire protection calculations for completeness and accuracy.

22. Check Design Specifications.

Verify all mechanical, plumbing and fire protection design specifications have been correctly edited. Verify all “notes to designer” have been addressed. Verify all “as indicated” references are actually indicated on the drawings.

23. Check Design Drawings.

Review all mechanical, plumbing and fire protection drawings for completeness, accuracy, and coordination with other disciplines.

End of activity.

Flow Chart

Mechanical Design Review Checklist for Military Projects

